INSTALLATION INSTRUCTIONS

13ACD Series Units

CONDENSING UNITS
504,942M
03/06
Supersedes 02/06

Technical
Publications
Litho U.S.A.

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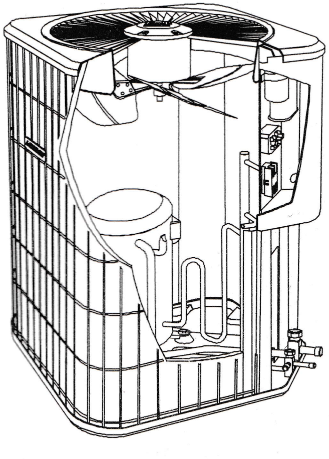
Dallas, Texas, USA



⚠ WARNING

Improper installation, adjustment, alteration, service or maintenance can cause personal injury, loss of life, or damage to property.

Installation and service must be performed by a qualified installer or service agency.

⚠ IMPORTANT

The Clean Air Act of 1990 bans the intentional venting of refrigerant (CFC's and HCFC's) as of July 1, 1992. Approved methods of recovery, recycling or reclaiming must be followed. Fines and/or incarceration may be levied for noncompliance.

⚠ WARNING

This product and/or the indoor unit it is matched with may contain fiberglass wool.

Disturbing the insulation during installation, maintenance, or repair will expose you to fiberglass wool dust. Breathing this may cause lung cancer. (Fiberglass wool is known to the State of California to cause cancer.)

Fiberglass wool may also cause respiratory, skin, and eye irritation.

To reduce exposure to this substance or for further information, consult material safety data sheets available from address shown below, or contact your supervisor.

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**RETAIN THESE INSTRUCTIONS
FOR FUTURE REFERENCE**

13ACD Outdoor Units

The Lennox 13ACD Merit® Series outdoor units are designed for use in either fixed orifice or expansion valve (TXV) systems. Refer to the Lennox Engineering Handbook for expansion valve kits which must be ordered separately.

⚠ CAUTION

Physical contact with metal edges and corners while applying excessive force or rapid motion can result in personal injury. Be aware of, and use caution when working near these areas during installation or while servicing this equipment.

Shipping & Packing List

1 - Assembled outdoor unit
1 - Fixed orifice refrigerant metering device

Check the unit for shipping damage. If you find any damage, immediately contact the last carrier.

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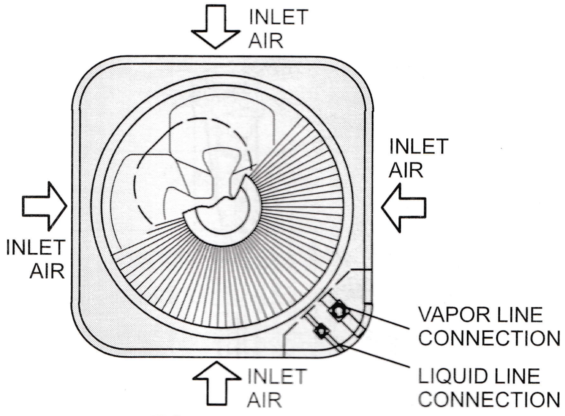
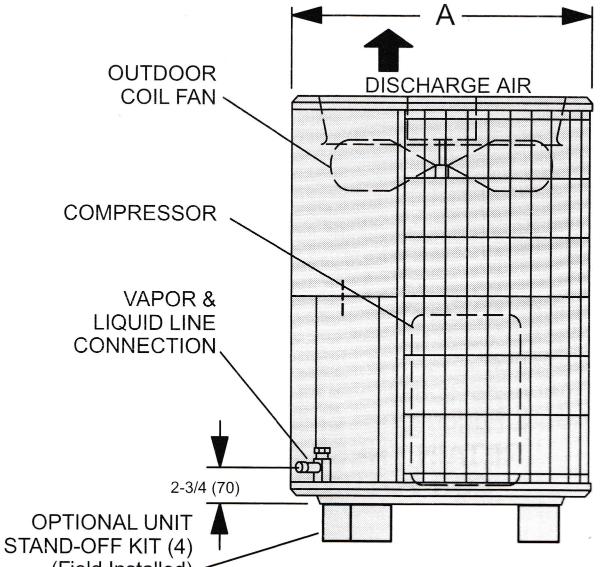
Unit Dimensions - inches (mm)

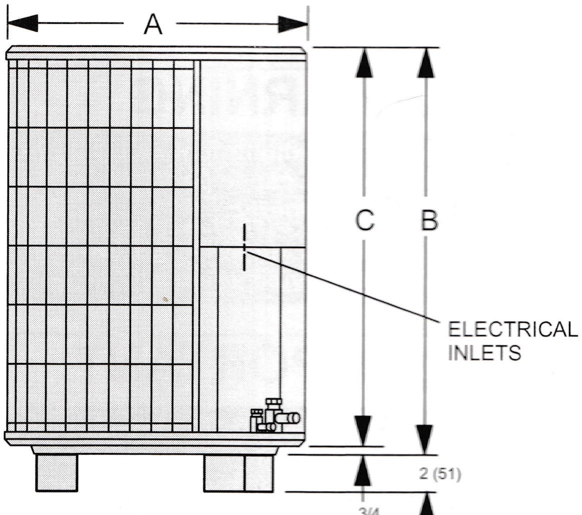
Model	A	B	C
13ACD-018, -030,-036	24-1/4 (616)	29-1/4 (743)	28-1/2 (724)
13ACD-024, -042	24-1/4 (616)	33-1/4 (845)	32-1/2 (826)
13ACD-048, -060	28-1/4 (718)	43-1/4 (1099)	42-1/2 (1080)



TOP VIEW


A
DISCHARGE AIR
OUTDOOR COIL FAN
COMPRESSOR
VAPOR & LIQUID LINE CONNECTION
2-3/4 (70)
OPTIONAL UNIT STAND-OFF KIT (4) (Field Installed)

SIDE VIEW



SIDE VIEW

General Information

These instructions are intended as a general guide and do not supersede local codes in any way. Consult authorities who have jurisdiction before installation.

When servicing or repairing HVAC components, ensure the fasteners are appropriately tightened. Table 1 shows torque values for fasteners.

Table 1

Torque Requirements

Part	Recommended Torque	
Service valve cap	8 ft.- lb.	11 NM
Sheet metal screws	16 in.- lb.	2 NM
Machine screws #10	28 in.- lb.	3 NM
Compressor bolts	90 in.- lb.	10 NM
Gauge port seal cap	8 ft.- lb.	11 NM

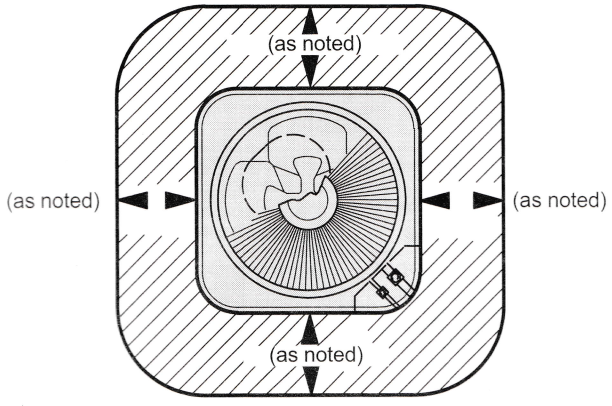
Setting the Unit

CAUTION

In order to avoid injury, take proper precaution when lifting heavy objects.

Refer to unit dimensions for sizing mounting slab, platforms or supports. Refer to figure 1 for installation clearances.

Installation Clearances



*A service clearance of 30" (762 mm) must be maintained on one of the sides adjacent to the control box. Clearance to one of the other three sides must be 36" (914 mm). Clearance to one of the remaining two sides may be 12" (304 mm) and the final side may be 6" (152 mm).

A clearance of 24" (610 mm) must be maintained between two units. 48" (1219 mm) clearance required on top of unit. Maximum soffit overhang is 36" (914 mm).

Figure 1

Roof Mounting

Install the unit at a minimum of 4 inches (102 mm) above the surface of the roof. Ensure the weight of the unit is properly distributed over roof joists and rafters. Redwood or steel supports are recommended.

Slab Mounting

When installing a unit at grade level, the top of the slab should be high enough above the grade so that water from higher ground would not collect around the unit. See figure 2. Slab may be level or have a slope tolerance away from the building of not more than 2 degrees or 2 inches per 5 feet (51 mm per 1524 mm).

Slab Mounting At Ground Level

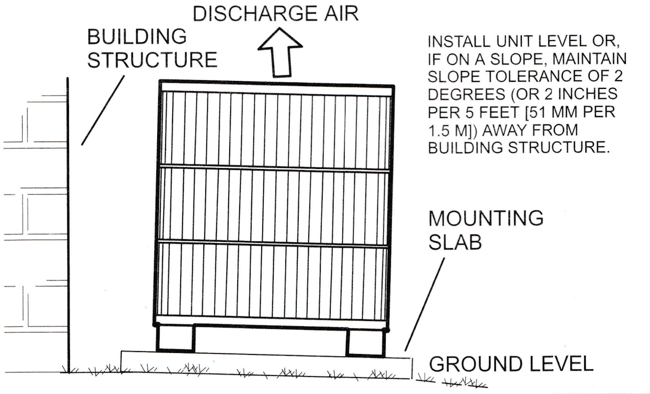

DISCHARGE AIR
BUILDING STRUCTURE
INSTALL UNIT LEVEL OR, IF ON A SLOPE, MAINTAIN SLOPE TOLERANCE OF 2 DEGREES (OR 2 INCHES PER 5 FEET [51 MM PER 1.5 M]) AWAY FROM BUILDING STRUCTURE.
MOUNTING SLAB
GROUND LEVEL

Figure 2

Electrical

In the United States, wiring must conform with current local codes and the current National Electric Code (NEC). In Canada, wiring must conform with current local codes and the current Canadian Electrical Code (CEC). Refer to the furnace or blower coil installation instructions for additional wiring application diagrams and refer to unit nameplate for minimum circuit ampacity and maximum overcurrent protection size.

WARNING

Electric Shock Hazard. Can cause injury or death.

Line voltage is present at all components on units with single-pole contactors, even when unit is not in operation!

Unit may have multiple power supplies. Disconnect all remote electric power supplies before opening access panel.

Unit must be grounded in accordance with national and local codes.

1. Install line voltage power supply to unit from a properly sized disconnect switch. Any excess high voltage field wiring should be trimmed or secured away from the low voltage field wiring (see figures 3 and 4).

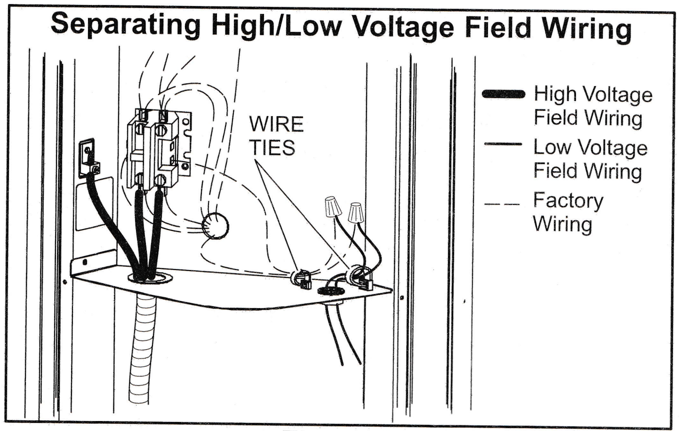
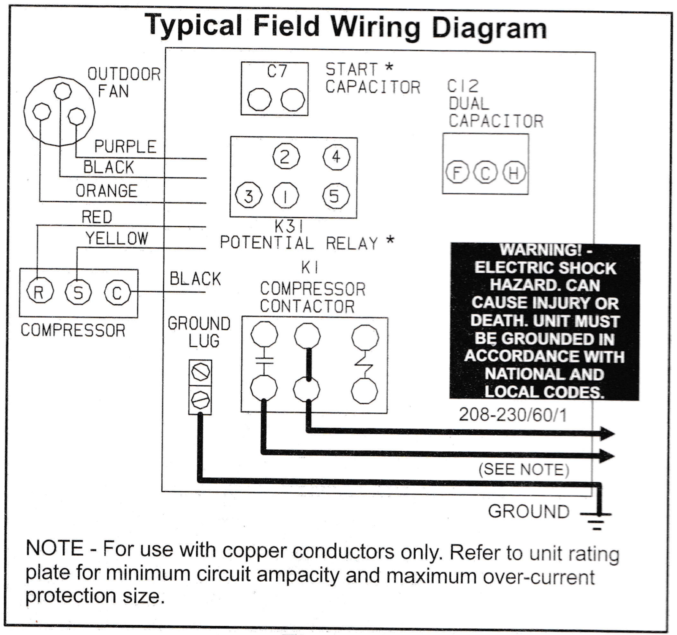

Separating High/Low Voltage Field Wiring
WIRE TIES
High Voltage Field Wiring
Low Voltage Field Wiring
Factory Wiring

Figure 3

2. Ground unit at unit disconnect switch or to an earth ground.

   NOTE - To facilitate conduit, a hole is located in the bottom of the control box. Connect conduit to the control box using a proper conduit fitting. Units are approved for use only with copper conductors.

   24V, Class II circuit connections are made to the low voltage pigtails. Refer to figure 4 for field wiring diagram. A complete unit wiring diagram is located inside the unit control box cover.



WARNING! - ELECTRIC SHOCK HAZARD. CAN CAUSE INJURY OR DEATH. UNIT MUST BE GROUNDED IN ACCORDANCE WITH NATIONAL AND LOCAL CODES.

NOTE - For use with copper conductors only. Refer to unit rating plate for minimum circuit ampacity and maximum over-current protection size.

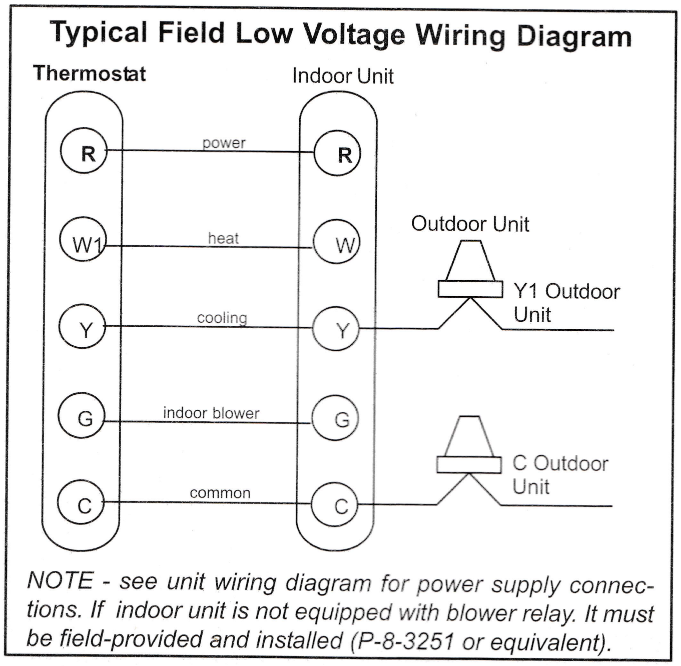
Figure 4

3. Install room thermostat (ordered separately) on an inside wall approximately in the center of the conditioned area and 5 feet (1.5 m) from the floor. It should not be installed on an outside wall or where it can be affected by sunlight, drafts or vibrations.

   NOTE - For proper voltages, select thermostat wire gauge per the following chart:

Wire run length	AWG #	Insulation type
less than 100' (30m)	18	color-coded, temperature rating 35°C minimum
more than 100' (30m)	16	

4. Install low voltage wiring from outdoor to indoor unit and from thermostat to indoor unit (see figure 5).
5. Do not bundle any excess 24V control wire inside control box. Run control wire through installed wire tie and tighten wire tie to provide low voltage strain relief and to maintain separation of field installed low and high voltage circuits (see figure 3).



NOTE - see unit wiring diagram for power supply connections. If indoor unit is not equipped with blower relay. It must be field-provided and installed (P-8-3251 or equivalent).

Figure 5

Refrigerant Piping

Field refrigerant piping consists of liquid and vapor lines from the outdoor unit (sweat connections) to the indoor coil (flare or sweat connections). Use Lennox L15 (sweat, non-flare) series line sets as shown in table 2 or use field-fabricated refrigerant lines. Refer to Refrigerant Piping Guide (Corp. 9351-L9) for proper size, type, and application of field-fabricated lines. Valve sizes are also listed in table 2.

Table 2

Refrigerant Line Sets

Model	Valve Field Size Connections		Recommended Line Set		
	Liquid Line	**Vapor Line**	**Liquid Line**	**Vapor Line**	**L15 Line Sets**
-018 **-024** **-030**	3/8 in. (10 mm)	3/4 in. (19 mm)	3/8 in (10 mm)	3/4 in. (19 mm)	L15-41 15 ft. - 50 ft. (4.6 m - 15 m)
-036 **-042** **-048**	3/8 in. (10 mm)	7/8 in (22 mm)	3/8 in. (10 mm)	7/8in (22 mm)	L15-65 15 ft. - 50 ft. (4.6 m - 15 m)
-060	3/8 in. (10 mm)	1-1/8 in. (29 mm)	3/8 in. (10 mm)	1-1/8 in. (29 mm)	Field Fabricated

NOTE - Units are designed for line sets of up to fifty feet (15 m). For applications longer than fifty feet, consult the Lennox Refrigerant Piping Guide (Corp. 9351-L9). Select line set diameters from table 2 to ensure that oil returns to the compressor.

Installing Refrigerant Line

During the installation of any heat pump or a/c system, it is important to properly isolate the refrigerant lines to prevent unnecessary vibration. Line set contact with the structure (wall, ceiling or floor) can cause objectionable sound as a result of the vibration; therefore, pay close attention to line set isolation.

Following are some points to consider when placing and installing a high-efficiency outdoor unit:

1. **Placement -** Be aware some localities are adopting sound ordinances based upon the sound level of the unit at the property line, not at the point of installation. Install the unit as far as possible from the property line. When possible, do not install the unit directly outside a bedroom window. Glass has a very high level of sound transmission. Figure 6 shows how to place the outdoor unit and line set.

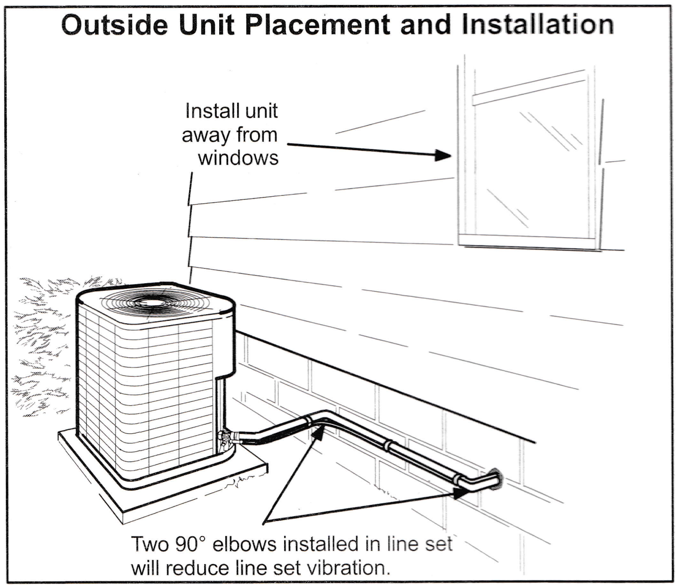

Outside Unit Placement and Installation
Install unit away from windows
Two 90° elbows installed in line set will reduce line set vibration.

Figure 6

2. **Line Set Isolation -** The following illustrations demonstrate procedures which ensure proper refrigerant line set isolation. Figure 7 shows how to install line sets on horizontal runs. Figure 8 shows how to make a transition from horizontal to vertical. Figure 9 shows how to install line sets on vertical runs.

Brazing Connection Procedure

1. Cut ends of the refrigerant lines square (free from nicks or dents). Debur the ends. The pipe must remain round, do not pinch end of the line.
2. Before making line set connections, use dry nitrogen to purge the refrigerant piping. This will help to prevent oxidation and the introduction of moisture into the system.
3. Use silver alloy brazing rods (5 or 6 percent minimum silver alloy for copper-to-copper brazing or 45 percent silver alloy for copper-to-brass or copper-to-steel brazing) which are rated for use with HCFC-22 refrigerant.
4. Wrap a wet cloth around the valve body and copper tube stub to protect it from heat damage during brazing. Wrap another wet cloth underneath the valve body to protect the base paint.
5. Braze the line set to the service valve. Quench the joints with a wet cloth to prevent possible heat damage to the valve core and opening port.

   NOTE - The tube end must stay bottomed in the fitting during final assembly to ensure proper seating, sealing and rigidity.

6. Install the factory-provided fixed orifice (or thermal expansion valve which is sold separately and which is approved for use with HCFC-22 refrigerant) in the liquid line at the indoor coil.

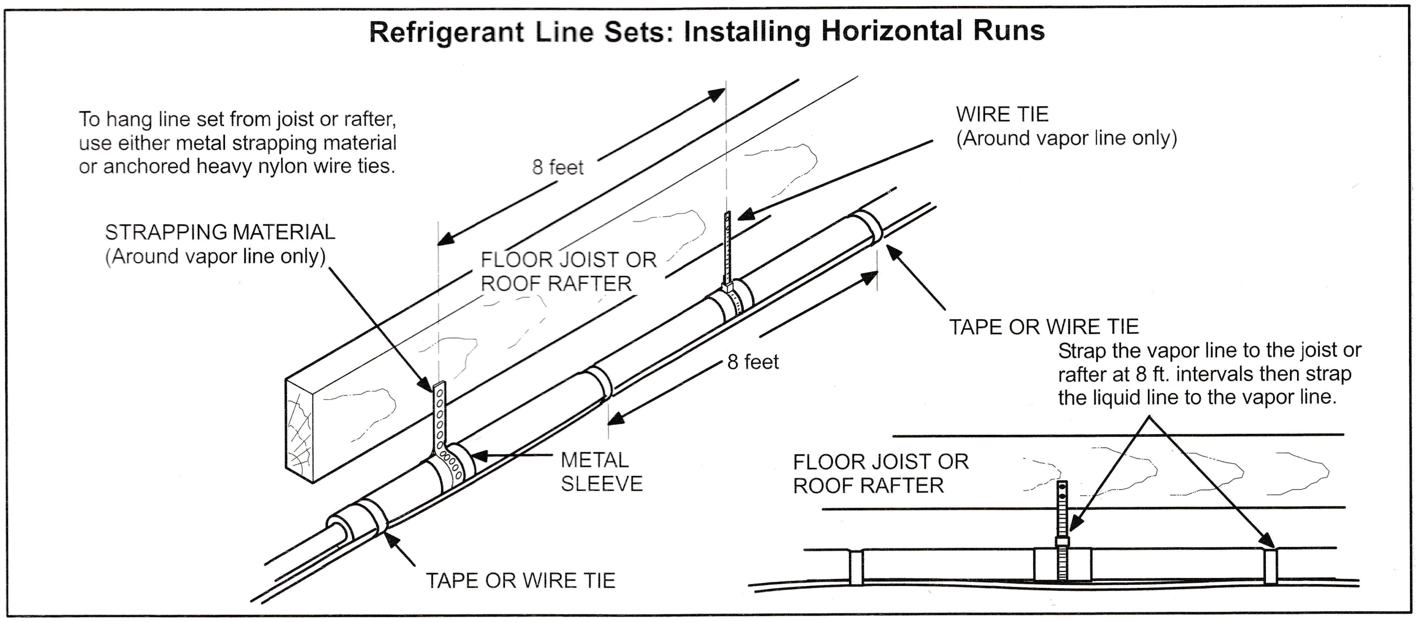
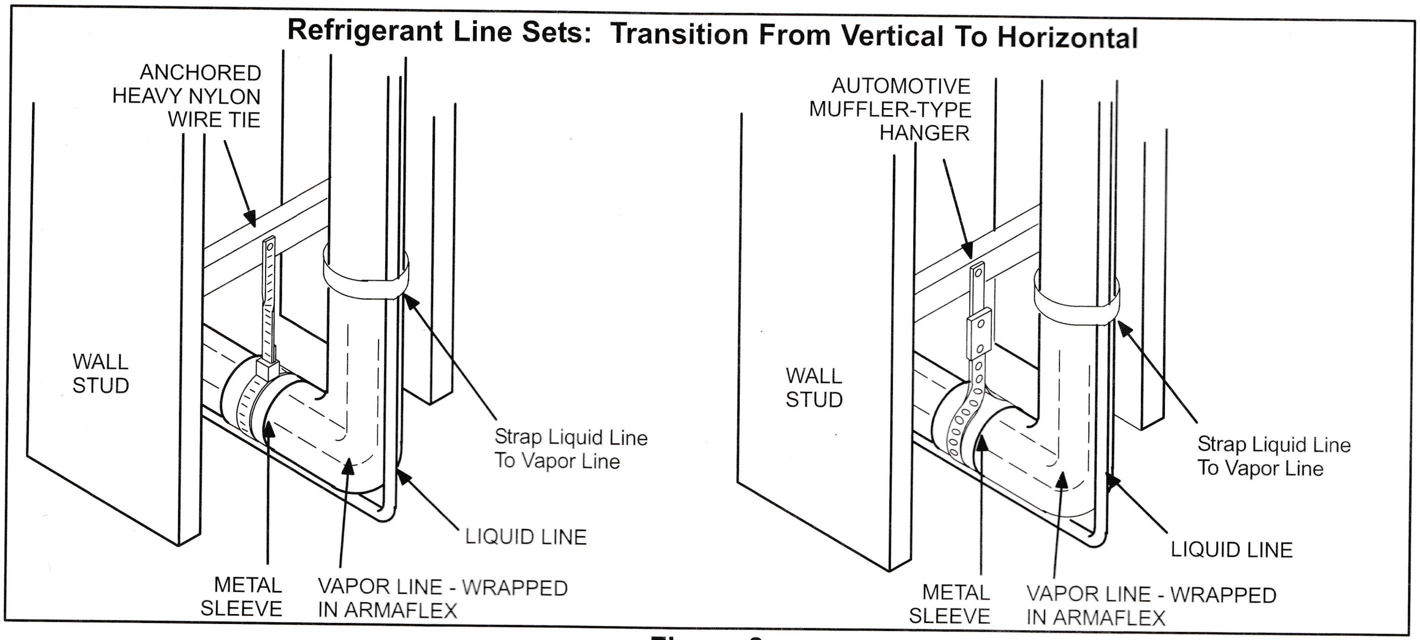

Refrigerant Line Sets: Installing Horizontal Runs
To hang line set from joist or rafter, use either metal strapping material or anchored heavy nylon wire ties.
8 feet
WIRE TIE (Around vapor line only)
STRAPPING MATERIAL (Around vapor line only)
FLOOR JOIST OR ROOF RAFTER
TAPE OR WIRE TIE
Strap the vapor line to the joist or rafter at 8 ft. intervals then strap the liquid line to the vapor line.
8 feet
METAL SLEEVE
FLOOR JOIST OR ROOF RAFTER
TAPE OR WIRE TIE

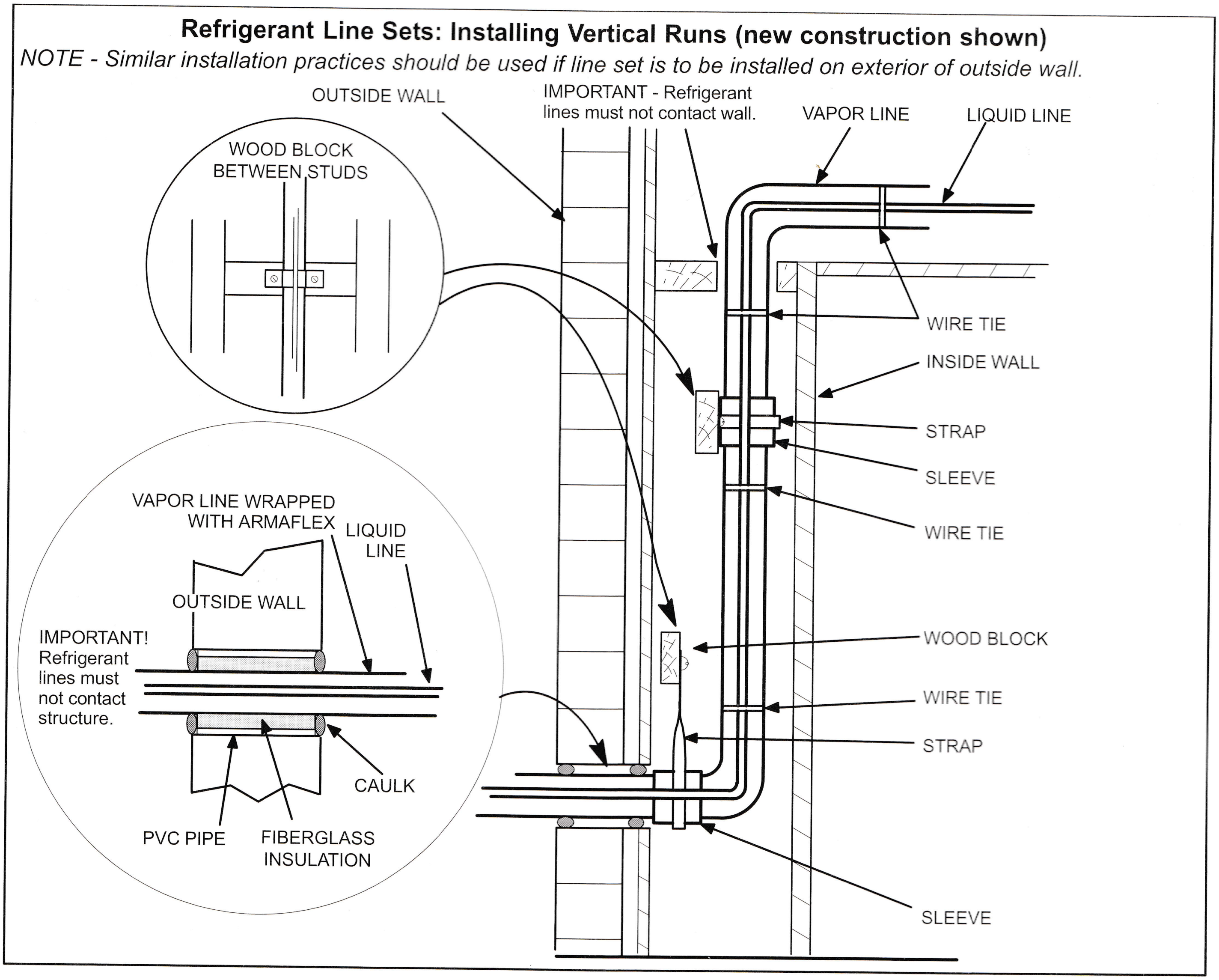
Figure 7



Refrigerant Line Sets: Transition From Vertical To Horizontal

ANCHORED HEAVY NYLON WIRE TIE
WALL STUD
Strap Liquid Line To Vapor Line
LIQUID LINE
METAL SLEEVE
VAPOR LINE - WRAPPED IN ARMAFLEX
AUTOMOTIVE MUFFLER-TYPE HANGER
WALL STUD
Strap Liquid Line To Vapor Line
LIQUID LINE
METAL SLEEVE
VAPOR LINE - WRAPPED IN ARMAFLEX

Figure 8



Refrigerant Line Sets: Installing Vertical Runs (new construction shown)

NOTE - Similar installation practices should be used if line set is to be installed on exterior of outside wall.

Figure 9

Refrigerant Metering Devices

13ACD units can be used in either fixed orifice systems or TXV systems. See the Lennox Engineering Handbook for approved TXV and fixed orifice match-ups and application information. Table 2 lists the unit liquid and vapor line sizes and corresponding line sets.

Fixed Orifice Systems

Replace the existing indoor unit fixed orifice with the orifice supplied with the outdoor unit. Place the supplied fixed orifice sticker on the indoor cabinet after installation.

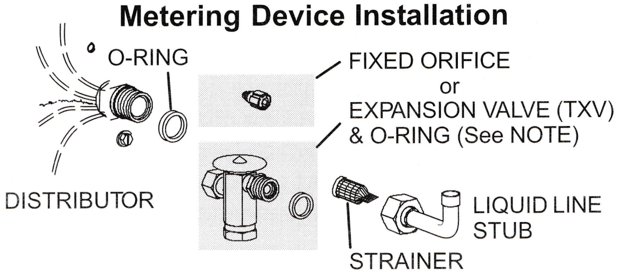
See table 3 for the fixed orifice size for each unit. In non-standard applications, the provided fixed orifice may not be appropriately sized. Refer to the Engineering Handbook for specific orifice information.

Table 3

Fixed Orifice Part Numbers & Drill Sizes

Model	Part Number	Drill Size
13ACD-018	100484-07	0.055
13ACD-024	100484-12	0.062
13ACD-030	100484-19	0.070
13ACD-036	100484-24	0.076
13ACD-042	100484-30	0.082
13ACD-048	100484-38	0.091
13ACD-060	100484-45	0.099

Install the fixed orifice as shown in figure 10. Do not twist the cap tubes when loosening the seal nut from the orifice housing.



Metering Device Installation

NOTE - If installing expansion valve with an indoor coil that includes a fixed orifice, remove orifice before installing valve.

Figure 10

Expansion Valve Systems

Expansion valves equipped with either Chatleff or flare type fittings are available from Lennox. Refer to the Engineering Handbook for expansion valves for use with specific match-ups.

If you install an expansion valve with an indoor coil that includes a fixed orifice, remove the orifice before the expansion valve is installed.

⚠ IMPORTANT

Failure to remove the fixed orifice when installing an expansion valve on the indoor coil will result in improper operation and damage to the system.

Manifold Gauge Set

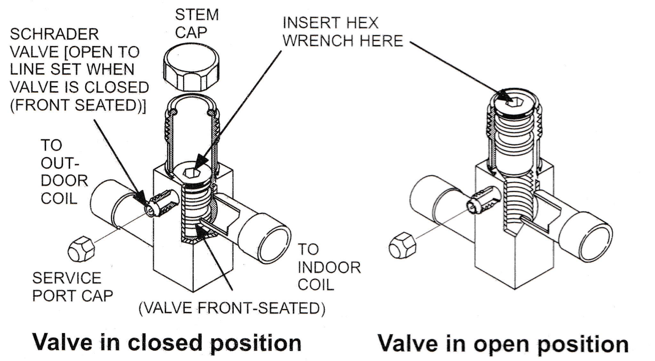
When checking the unit charge, use a manifold gauge set-that is equipped with “low loss” hoses. Do not use a manifold gauge set with anything other than a “low loss” hose.

Service Valves

The service valves (liquid line - figure 11, vapor line - figures 12 and 13) and gauge ports are used for leak testing, evacuating, charging and checking charge. Each valve is equipped with a service port which has a factory-installed Schrader valve. A service port cap protects the Schrader valve from contamination and serves as the primary leak seal.

NOTE - 13ACD-018, -024, and -030 units are equipped with the same type of service valve on both liquid and vapor lines; ball-type valves (figure 13) are used on larger units.

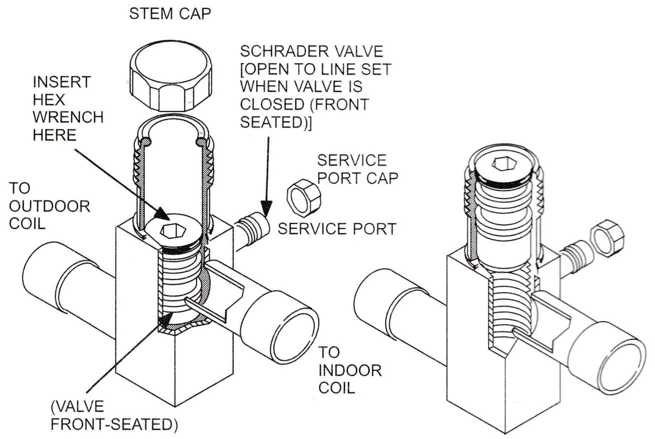
Front-Seated Liquid Line Service Valve



Valve in closed position **Valve in open position**

Figure 11

Front-Seated Vapor Line Service Valve



Valve in closed position **Valve in open position**

Figure 12

To Access Schrader Port:

1. Remove service port cap with an adjustable wrench.
2. Connect gauge to the service port.
3. When testing is complete, replace service port cap. Tighten finger tight, then torque per table 1 (Page 3).

To Open Front-Seated Service Valves:

1. Remove stem cap with an adjustable wrench.
2. Use a service wrench with a hex-head extension (3/16” for liquid-line valve sizes; 5/16” for vapor-line valve sizes) to back the stem out counterclockwise as far as it will go.
3. Replace the stem cap. Tighten finger tight, then torque per table 1 (Page 3).

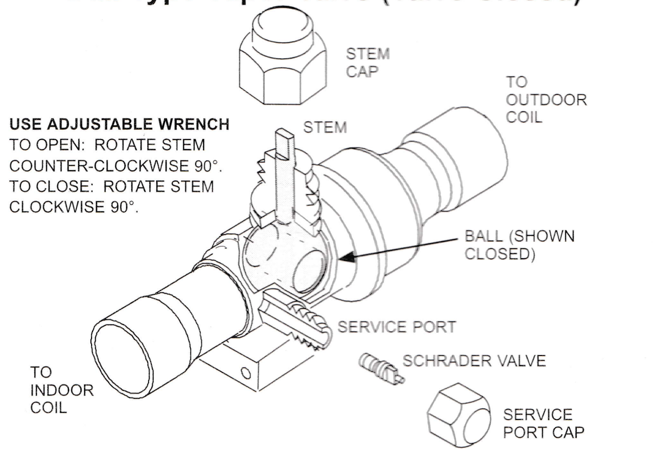
To Close Front-Seated Service Valves:

1. Remove the stem cap with an adjustable wrench.
2. Use a service wrench with a hex-head extension (3/16” for liquid-line valve sizes; 5/16” for vapor-line valve sizes) to turn the stem clockwise to seat the valve. Tighten it firmly.
3. Replace the stem cap. Tighten finger tight, then torque per table 1 (Page 3).

Vapor Line Ball Valve

Ball-type service valves (see figure 13) function the same way as the other valves but cannot be rebuilt; if one fails, replace with a new valve. The ball valve is equipped with a service port with a factory-installed Schrader valve. A service port cap protects the Schrader valve from contamination and assures a leak-free seal.

Ball-Type Vapor Valve (Valve Closed)



USE ADJUSTABLE WRENCH
TO OPEN: ROTATE STEM COUNTER-CLOCKWISE 90°.
TO CLOSE: ROTATE STEM CLOCKWISE 90°.

Figure 13

Leak Testing

After the line set has been connected to the indoor and outdoor units, check the line set connections and indoor unit for leaks.

WARNING

Danger of fire!

Bleeding the refrigerant charge from only the high side may result in the low side shell and suction tubing being pressurized. Application of a brazing torch while pressurized may result in ignition of the refrigerant and oil mixture - check the high and low pressures before unbrazing.

WARNING

Refrigerant can be harmful if it is inhaled. Refrigerant must be used and recovered responsibly.

Failure to follow this warning may result in personal injury or death.

WARNING

Danger of explosion!

Can cause equipment damage, injury or death. Never use oxygen to pressurize a refrigeration or air conditioning system. Oxygen will explode on contact with oil and could cause personal injury.

WARNING

Danger of explosion!

When using a high pressure gas such as dry nitrogen to pressurize a refrigeration or air conditioning system, use a regulator that can control the pressure down to 1 or 2 psig (6.9 to 13.8 kPa).

Using an Electronic Leak Detector or Halide

1. Connect a cylinder of HCFC-22 to the center port of the manifold gauge set.
2. With both manifold valves closed, open the valve on the HCFC-22 cylinder (vapor only).
3. Open the high pressure side of the manifold to allow HCFC-22 into the line set and indoor unit. Weigh in a trace amount of HCFC-22. [A trace amount is a maximum of 2 ounces (57 g) or 3 pounds (31 kPa) pressure.] Close the valve on the HCFC-22 cylinder and the valve on the high pressure side of the manifold gauge set. Disconnect the HCFC-22 cylinder.
4. Connect a cylinder of dry nitrogen with a pressure regulating valve to the center port of the manifold gauge set.
5. Connect the manifold gauge set high pressure hose to the vapor valve service port. *(Normally, the high pressure hose is connected to the liquid line port; however, connecting it to the vapor port better protects the manifold gauge set from high pressure damage.)*
6. Adjust the dry nitrogen pressure to 150 psig (1034 kPa). Open the valve on the high side of the manifold gauge set which will pressurize line set and indoor unit.
7. After a few minutes, open a refrigerant port to ensure the refrigerant you added is adequate to be detected. (Amounts of refrigerant will vary with line lengths.) Check all joints for leaks. Purge dry nitrogen and HCFC-22 mixture. Correct any leaks and recheck.

Evacuation

Evacuating the system of noncondensables is critical for proper operation of the unit. Noncondensables are defined as any gas that will not condense under temperatures and pressures present during operation of an air conditioning system. Noncondensables and water vapor combine with refrigerant to produce substances that corrode copper piping and compressor parts.

IMPORTANT

Use a thermocouple or thermistor electronic vacuum gauge that is calibrated in microns. Use an instrument that reads from 50 microns to at least 23,000 microns.

1. Connect manifold gauge set to the service valve ports as follows:
    - low pressure gauge to *vapor* line service valve
    - high pressure gauge to *liquid* line service valve
2. Connect micron gauge.
3. Connect the vacuum pump (with vacuum gauge) to the center port of the manifold gauge set.
4. Open both manifold valves and start the vacuum pump.
5. Evacuate the line set and indoor unit to an **absolute pressure** of 23,000 microns (29.01 inches of mercury). During the early stages of evacuation, it is desirable to close the manifold gauge valve at least once to determine if there is a rapid rise in **absolute pressure**. A rapid rise in pressure indicates a relatively large leak. If this occurs, repeat the leak testing procedure.

    NOTE - The term ***absolute pressure*** *means the total actual pressure within a given volume or system, above the absolute zero of pressure. Absolute pressure in a vacuum is equal to atmospheric pressure minus vacuum pressure.*
6. When the absolute pressure reaches 23,000 microns (29.01 inches of mercury), close the manifold gauge valves, turn off the vacuum pump and disconnect the manifold gauge center port hose from vacuum pump. Attach the manifold center port hose to a dry nitrogen cylinder with pressure regulator set to 150 psig (1034 kPa) and purge the hose. Open the manifold gauge valves to break the vacuum in the line set and indoor unit. Close the manifold gauge valves.

⚠ CAUTION

Danger of Equipment Damage.

Avoid deep vacuum operation. Do not use compressors to evacuate a system. Extremely low vacuums can cause internal arcing and compressor failure.

Damage caused by deep vacuum operation will void warranty.

7. Shut off the dry nitrogen cylinder and remove the manifold gauge hose from the cylinder. Open the manifold gauge valves to release the dry nitrogen from the line set and indoor unit.
8. Reconnect the manifold gauge to the vacuum pump, turn the pump on, and continue to evacuate the line set and indoor unit until the absolute pressure does not rise above 500 microns (29.9 inches of mercury) within a 20-minute period after shutting off the vacuum pump and closing the manifold gauge valves.
9. When the absolute pressure requirement above has been met, disconnect the manifold hose from the vacuum pump and connect it to an upright cylinder of HCFC-22 refrigerant. Open the manifold gauge valves to break the vacuum from 1 to 2 psig positive pressure in the line set and indoor unit. Close manifold gauge valves and shut off the HCFC-22 cylinder and remove the manifold gauge set.

Start-Up

⚠ IMPORTANT

If unit is equipped with crankcase heater, it should be energized 24 hours before unit start-up to prevent compressor damage as a result of slugging.

1. Rotate fan to check for frozen bearings or binding.
2. Inspect all factory- and field-installed wiring for loose connections.
3. After evacuation is complete, open the liquid line and vapor line service valves to release refrigerant charge (contained in outdoor unit) into the system.
4. Replace the stem caps and secure finger tight, then tighten an additional one-sixth (1/6) of a turn.
5. Check voltage supply at the disconnect switch. The voltage must be within the range listed on the unit's nameplate. If not, do not start the equipment until you have consulted the power company and the voltage condition has been corrected.
6. Set the thermostat for a cooling demand. Turn on power to the indoor blower and close the outdoor unit disconnect switch to start the unit.
7. Recheck voltage while the unit is running. Power must be within range shown on the nameplate.

Refrigerant Charging

Proper Air-Flow Range

⚠ IMPORTANT

Before attempting to charge any system, confirm proper airflow across the indoor coil. Airflow over the indoor coil can be determined by measuring the static pressure drop across the coil and comparing it with the factory table provided in the indoor coil installation instructions.

Table 4

Dry Bulb Temperature of Air Leaving Indoor Coil (°F)

Dry bulb in-door*	Wet bulb temperature entering indoor coil													
	57	**58**	**59**	**60**	**61**	**62**	**63**	**64**	**65**	**66**	**67**	**68**	**69**	**70**
70	51	51	52	52	53	53	54	55	55	56	57	58	59	60
72	52	52	53	54	55	55	56	57	57	58	59	60	61	62
74	53	53	53	54	55	55	56	57	58	58	59	60	61	62
76	54	54	54	55	55	56	57	57	58	59	60	61	62	63
78	55	55	55	56	56	57	57	58	59	60	61	62	63	64
80	56	56	56	57	57	58	58	58	60	61	62	63	64	65

* Dry-bulb temperature (°F) of air entering indoor coil.

NOTE - If the measured leaving dry bulb air temperature is 3°F (1.8°C) or **lower** than the indicated leaving air temperature, **increase** the indoor fan speed. If the measured leaving dry bulb air temperature is 3°F (1.8°C) or **more higher** than the indicated leaving air temperature, **decrease** the indoor fan speed.

Charging Systems

If the system is void of refrigerant, use the weigh-in method to initiate the charging of the unit. Once the initial charge has been weighed- in, complete the charging of the system according to the type of metering device.

Units are factory-charged with the amount of HCFC-22 refrigerant indicated on the unit rating plate. This charge is based on a matching indoor coil and outdoor coil with 15 feet (4.6 m) line set. For varying lengths of line set, refer to table 5 for refrigerant charge adjustment.

Table 5

Refrigerant Charge per Line Set Lengths

Liquid Line Set Diameter	Oz. per 5 ft. (g per 1.5 m) adjust from 15 ft. (4.6 m) line set*
3/8 in. (9.5 mm)	3 ounce per 5 ft. (85 g per 1.5 m)

*NOTE - *If line length is greater than 15 ft. (4.6 m), add this amount. If line length is less than 15 ft. (4.6 m), subtract this amount.*

The outdoor unit should be charged during warm weather. However, applications arise in which charging must occur in the colder months. The method of charging is determined by the unit's ***refrigerant metering device*** *and the* ***outdoor ambient temperature****.*

Measure the liquid line temperature and the outdoor ambient temperature as outlined below:

1. Connect the manifold gauge set to the service valves:
   - low pressure gauge to *vapor* valve service port
   - high pressure gauge to *liquid* valve service port
2. Close manifold gauge set valves. Connect the center manifold hose to an upright cylinder of HCFC-22.
3. Set the room thermostat to call for heat. This will create the necessary load for properly charging the system in the cooling cycle.
4. Use a digital thermometer to record the outdoor ambient temperature.
5. When the heating demand has been satisfied, switch the thermostat to cooling mode with a set point of 68° F (20° C). When pressures have stabilized, use a digital thermometer to record the liquid line temperature.
6. The outdoor temperature will determine which charging method to use. Proceed with the appropriate charging procedure.

Charge Using Weigh-in Method — (Fixed Orifice or TXV Systems) - Outdoor Temp. <65°F (18°C)

If the system is void of refrigerant, or if the outdoor ambient temperature is cool, use the weigh-in method to charge the unit. Do this after any leaks have been repaired.

1. Recover the refrigerant from the unit.
2. Conduct a leak check, then evacuate as previously outlined.
3. Weigh in the charge according to the total amount shown on the unit nameplate.

If weighing facilities are not available or if you are charging the unit during warm weather, follow one of the other procedures outlined below.

Complete the charging of the system according to the type of metering device.

Charge Using Subcooling Method —
(Fixed Orifice Systems) - Outdoor Temp. >65°F (18°C)

If you charge a fixed orifice system when the outdoor ambient is 65°F (18°C) or above, use the subcooling method to charge the unit.

Table 6

Subcooling Values For Fixed Orifice Systems

13ACD	-018	-024	-030	-036	-042	-048	-060
°F (°C)*	Liquid Subcooling [± 1°F (.6°C)]						
65 (18)	13 (7)	13 (7)	7 (4)	14 (8)	15 (8.3)	9 (5)	13 (7)
70 (21)	13 (7)	12 (6.7)	6 (3.3)	13 (7)	14 (8)	9 (5)	12 (6.7)
75 (24)	10 (5.6)	11 (6)	5 (3)	13 (7)	13 (7)	9 (5)	12 (6.7)
80 (27)	10 (5.6)	11 (6)	5 (3)	12 (6.7)	12 (6.7)	9 (5)	12 (6.7)
85 (29)	8 (4.5)	10 (5.6)	5 (3)	11 (6)	11 (6)	9 (5)	11 (6)
90 (32)	8 (4.5)	10 (5.6)	4 (2.2)	10 (5.6)	10 (5.6)	9 (5)	10 (5.6)
95 (35)	7 (4)	10 (5.6)	4 (2.2)	9 (5)	9 (5)	9 (5)	10 (5.6)
100 (38)	7 (4)	10 (5.6)	3 (2)	9 (5)	8 (4.5)	9 (5)	9 (5)
105 (41)	6 (3.3)	9 (5)	3 (2)	8 (4.5)	7 (4)	9 (5)	9 (5)
110 (43)	6 (3.3)	8 (4.5)	2 (1)	6 (3.3)	7 (4)	9 (5)	9 (5)
115 (45)	3 (2)	6 (3.3)	2 (1)	6 (3.3)	5 (3)	8 (4.5)	8 (4.5)

* Outdoor Ambient Temperature.

1. With the manifold gauge hose still on the liquid service port and the unit operating stably, use a digital thermometer to record the liquid line temperature.
2. At the same time, record the liquid line pressure reading.
3. Use a temperature/pressure chart for HCFC-22 to determine the saturation temperature for the liquid line pressure reading.
4. Subtract the liquid line temperature from the saturation temperature (according to the chart) to determine subcooling.

____° **Saturation Temperature °F (°C)**
— ____° **Liquid Line Temperature °F (°C)**
= ____° **Subcooling Value °F (°C)**

5. Compare the subcooling value with those in table 6. If subcooling is greater than shown, recover some refrigerant. If subcooling is less than shown, add some refrigerant.

Charge using Superheat Method —
(Fixed Orifice Systems) - Outdoor Temp. >40ºF (4ºC)

This charging procedure *should not be used* if ambient temperatures are below 40ºF (4ºC). For best results, indoor temperature should be 70ºF (21ºC) to 80ºF (26ºC).

1. Measure the wet bulb temperature of indoor return air and dry bulb temperature of the outdoor entering air.
2. Use table 7 to find the **superheat** value at those conditions.

Table 7

Superheat Values For Fixed Orifice Systems

*Dry bulb outdoor	Wet bulb (air entering indoor coil)													
	50	52	54	56	58	60	62	64	66	68	70	72	74	76
40	15	18	20	23	26	29	32	34	38	41	43	46	48	51
45	13	16	18	21	24	27	30	33	36	39	41	44	46	49
50	11	14	16	19	22	25	28	31	34	37	39	42	44	47
55	9	12	14	17	20	23	27	30	33	36	38	40	42	44
60	7	10	12	15	18	21	24	27	30	33	35	38	40	43
65	-	6	10	13	16	19	21	24	27	30	33	36	38	41
70	-	-	7	10	13	16	19	21	24	27	30	33	36	39
75	-	-	-	6	9	12	15	18	21	24	28	31	34	37
80	-	-	-	-	5	8	12	15	18	21	25	28	31	35
85	-	-	-	-	-	-	8	11	15	19	22	26	30	33
90	-	-	-	-	-	-	5	9	13	16	20	24	27	31
95	-	-	-	-	-	-	-	6	10	14	18	22	25	29
100	-	-	-	-	-	-	-	-	8	12	16	21	24	28
105	-	-	-	-	-	-	-	-	5	9	13	17	22	26
110	-	-	-	-	-	-	-	-	-	6	11	15	20	25
115	-	-	-	-	-	-	-	-	-	-	8	14	18	24

* Dry-bulb temperature (ºF) of outdoor entering air.

NOTE - Do not attempt to charge system where a dash appears, system could be overcharged. Superheat is taken at vapor line service port. Vapor line superheat must never be less than 5ºF at the vapor line service port.

Charge Using Approach Method —

(TXV Systems) - Outdoor Temp. >65°F (18°C)

When charging an expansion valve system when the outdoor ambient temperature is 65°F (18°C) or above, it is best to charge the unit using the approach method. Subtract the outdoor ambient temperature from the liquid line temperature to determine the approach temperature.

____° **Liquid Line Temperature °F (°C)**
— ____° **Outdoor Ambient Temperature °F (°C)**
= ____° **Approach Value °F (°C)**

The resulting difference (approach temperature) should agree with the values given in table 8. If not, add refrigerant to lower the approach temperature or recover refrigerant from the system to increase the approach temperature.

Table 8

13ACD Approach Values [°F (°C)]

Model	-018	-024	-030	-036	-042	-048	-060
Value	6 (3.3)	10 (5.6)	11 (6)	9 (5)	6 (3.3)	5 (2.8)	8 (4.4)
NOTE - For best results, use the same digital thermometer to check both outdoor ambient and liquid temperatures.							

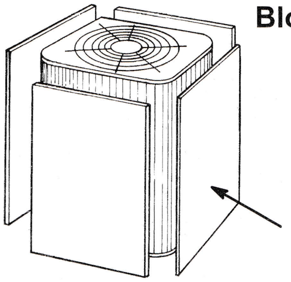
Charge using Subcooling Method —

(TXV Systems) - Outdoor Temp. >40°F (4°C)

This charging procedure *should not be used* if ambient temperatures are below 40°F. For best results, indoor temperature should be 70°F (21°C) to 80°F (26°C).

1. Restrict the airflow (see figure 14) through the outdoor coil to achieve pressures from 200-250 psig (1379-1724 kPa). These higher pressures are necessary for checking the charge. Block equal sections of air intake panels and move coverings sideways until the liquid pressure is in the above noted ranges.

Blocking Outdoor Coil



*Outdoor coil should be blocked one side at a time with cardboard or plastic sheet until proper testing pressures are reached.

cardboard or plastic sheet

*Four-sided unit shown.

Figure 14

2. With the manifold gauge hose installed on the liquid service port and the unit operating stably, use a digital thermometer to record the liquid line temperature.
3. At the same time, record the liquid line pressure reading.
4. Use a temperature/pressure chart for the appropriate refrigerant to determine the saturation temperature for the liquid line pressure reading.
5. Subtract the refrigerant saturation temperature from the liquid line temperature to determine subcooling.

____° **Saturation Temperature °F (°C)**
— ____° **Liquid Line Temperature °F (°C)**
= ____° **Subcooling Value °F (°C)**

6. Compare subcooling value with those show in the unit information. If subcooling is greater than shown, recover some refrigerant. If subcooling is less, add some refrigerant.

Checking Charge Using Normal Operating Pressures

IMPORTANT

Use table 9 to help perform maintenance checks. Table 9 is not a procedure for charging the system. Minor variations in these pressures may be due to differences in installations. Significant deviations could mean that the system is not properly charged or that a problem exists with some component in the system.

Table 9

Normal Operating Pressures

13ACD	-018	-024	-030	-036	-042	-048	-060
°F (°C)*	Liquid Line Pressure / Vapor Line Pressure**						
Expansion Valve (TXV)							
65 (18)	141 / 80	147 / 79	141 / 76	145 / 74	143 / 78	145 / 80	151 / 76
70 (21)	154 / 81	159 / 79	154 / 76	157 / 75	153 / 79	157 / 81	164 / 77
75 (24)	166 / 81	173 / 80	167 / 77	170 / 76	167 / 80	170 / 81	177 / 78
80 (27)	180 / 82	187 / 81	181 / 78	186 / 76	182 / 80	184 / 82	192 / 78
85 (29)	195 / 82	218 / 82	195 / 78	201 / 77	198 / 81	198 / 82	207 / 79
90 (32)	209 / 83	202 / 81	210 / 79	217 / 77	215 / 81	214 / 83	223 / 80
95 (35)	222 / 83	234 / 82	227 / 80	234 / 78	231 / 82	230 / 84	240 / 80
100 (38)	244 / 84	251 / 83	249 / 81	251 / 79	249 / 83	247 / 84	259 / 81
105 (41)	258 / 85	267 / 84	260 / 81	268 / 79	268 / 84	265 / 85	277 / 81
110 (43)	276 / 85	287 / 84	278 / 82	288 / 80	287 / 84	283 / 85	297 / 82
115 (45)	294 / 86	307 / 85	299 / 83	309 / 81	308 / 85	303 / 86	318 / 83
Fixed Orifice (RFC)							
65 (18)	144 / 73	147 / 68	140 / 66	150 / 67	147 / 70	145 / 70	150 / 67
70 (21)	157 / 76	160 / 71	152 / 68	162 / 70	158 / 72	156 / 72	163 / 70
75 (24)	167 / 78	173 / 74	166 / 71	176 / 72	171 / 75	170 / 75	177 / 72
80 (27)	182 / 80	189 / 77	180 / 74	190 / 74	184 / 77	183 / 78	191 / 75
85 (29)	196 / 82	203 / 79	196 / 76	205 / 76	198 / 78	198 / 80	207 / 77
90 (32)	211 / 84	219 / 81	211 / 79	220 / 78	213 / 80	213 / 82	221 / 79
95 (35)	225 / 84	238 / 83	227 / 80	237 / 79	228 / 81	230 / 84	239 / 80
100 (38)	242 / 86	255 / 85	294 / 82	255 / 80	245 / 82	246 / 85	256 / 81
105 (41)	256 / 86	272 / 86	262 / 83	273 / 81	262 / 84	264 / 86	274 / 83
110 (43)	278 / 88	294 / 87	282 / 84	291 / 83	281 / 84	282 / 87	295 / 84
115 (45)	293 / 88	317 / 88	302 / 86	314 / 84	300 / 85	301 / 88	315 / 85

* Temperature of the air entering the outside coil.

** Values are typical pressures; indoor unit match up, indoor air quality equipment, and indoor load will cause the pressures to vary.

System Operation

The outdoor unit and indoor blower cycle on demand from the room thermostat. When the thermostat blower switch is in the **ON** position, the indoor blower operates continuously.

Maintenance

WARNING

Electric shock hazard. Can cause injury or death. Before attempting to perform any service or maintenance, turn the electrical power to unit OFF at disconnect switch(es). Unit may have multiple power supplies.

NOTE - White residue may surface on guards and grilles of outdoor units. This is caused by mild acids present in minute quantities in the plasticizer applied to make the coating flexible. The residue is comprised of non-toxic, common fatty acids found in natural animal and vegetable oils, and can be removed by wiping the parts with a cloth. Once outside, and over time, the rain will wash off any remaining residue.

Maintenance and service must be performed by a qualified installer or service agency. At the beginning of each cooling season, the system should be checked as follows:

1. Clean and inspect outdoor coil. The coil may be flushed with a water hose. Make sure power is off before cleaning.

   The outdoor coil is protected by an inner mesh screen and a wire cage (see figure 15). If debris has collected between the mesh screen and the coil and cannot be dislodged by spraying unpressurized water from the inside coil surface to the outside, the mesh may be removed by first removing the top of the unit which will allow for removal of the wire cage.

   Then, using pliers to grip the head of the push pins, pull straight out to extract the push pins along one side of the coil. If necessary, remove the push pins along the back of the unit; it is usually unnecessary to fully remove the inner mesh screen.

   Drape the mesh screen back and wash the coil. When all the debris has been removed from the coil, reinstall the mesh screen by positioning it in its original position and reinserting the push pin. No tool is required to push the pin back into the same slot in the fins.

   If the push pin is loose and tends not to stay in place, brush the fins with a fin brush (22 fins / in). Line up the push pin a couple fins to the right or left of the original hole and re-insert the pin.
2. Outdoor fan motor is prelubricated and sealed. No further lubrication is needed.
3. Visually inspect connecting lines and coils for evidence of oil leaks.
4. Check wiring for loose connections.
5. Check for correct voltage at unit (unit operating).

6. Check amp-draw outdoor fan motor.
   Unit nameplate _________ Actual ____________ .

NOTE - If owner reports insufficient cooling, the unit should be gauged and refrigerant charge checked. Refer to section on refrigerant charging in this instruction(see Page 11).

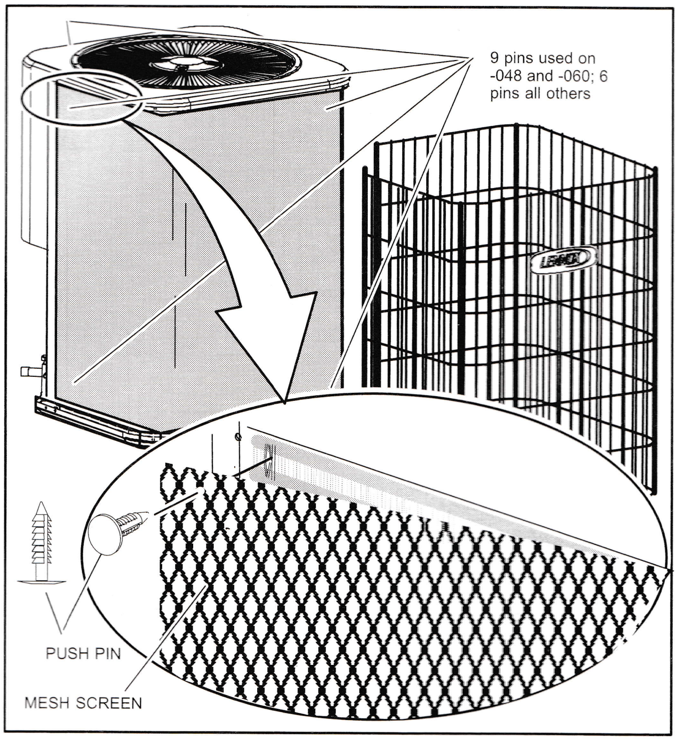


Figure 15

Indoor Coil

1. Clean coil, if necessary.
2. Check connecting lines and coils for signs of oil leaks.
3. Check the condensate pan line and clean if necessary.

Indoor Unit

1. Clean or change filters.
2. Adjust blower speed for cooling. The pressure drop over the coil should be measured to determine the correct blower CFM. Refer to the unit information service manual for pressure drop tables and procedure.
3. Check all wiring for loose connections
4. Check for correct voltage at unit (blower operating).
5. Check amp-draw on blower motor.
   Unit nameplate_________ Actual ___________.

Optional Accessories

Refer to the Engineering Handbook for optional accessories that may apply to this unit. The following may or may not apply:

- Loss of Charge Kit
- High Pressure Switch Kit
- Compressor Monitor
- Compressor Crankcase Heater
- Hail Guards
- Mounting Bases
- Timed Off Control
- Stand-off Kit
- Sound Cover
- Low Ambient Kit

Start-Up & Performance Check List

Job Name ____________________ Job no. ____________ Date ____________

Job Location ____________________ City ____________ State ____________

Installer ____________________ City ____________ State ____________

Unit Model No. ________ Serial No. ____________ Service Technician ____________

Nameplate Voltage ____________________

Rated Load Ampacity ________ Compressor ____________ Outdoor Fan ____________

Maximum Fuse or Circuit Breaker ____________________

Electrical Connections Tight? ☐ Indoor Filter clean? ☐ Supply Voltage (Unit Off) ____________

Indoor Blower RPM ______ S.P. Drop Over Indoor (Dry) ________ Outdoor Coil Entering Air Temp. ________

Discharge Pressure ______ Vapor Pressure ____________ Refrigerant Charge Checked? ☐

Refrigerant Lines: - Leak Checked? ☐ Properly Insulated? ☐ Outdoor Fan Checked? ☐

Service Valves: --- Fully Opened? ☐ Caps Tight? ☐

Voltage With Compressor Operating ____________

Thermostat

Calibrated? ☐ Properly Set? ☐ Level? ☐